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DYNAMICS OF COENOPOPULATIONS AND DISTRIBUTION *ASCLEPIAS SYRIACA* L. IN VARIOUS HABITATS OF AGRICULTURAL LANDSCAPES AND ADJACENT LANDS IN CENTRAL RUSSIA

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Abstract. *Asclepias syriaca* L. is species-introduced with high potential as a source of biofuel, an important fodder crop for beekeeping, a possible source of biologically active substances. However, the species has a high invasive activity and may pose a threat to the biodiversity of natural plant communities. And also pose an economic threat to agroecosystems as a segetal species. In agricultural landscapes of central Russia in various habitats the dynamics and state of coenopopulation of the introduced in the crop species *A. syriaca*, which has a high potential invasive hazard at this moment, was studied. Research was conducted in 2012, 2018 and 2019 in the Belgorod region near the village Kulma, Novooskolskiy urban district. To assess the dynamics of the distribution *A. syriaca* in 2012 a polygon was formed for stationary observations on an area of about 5000 ha called Stationary “Kulma”. Modular coenopopulations growing in various habitats were identified within this stationary. In the process of research in the conditions of agrophytocenoses and adjacent lands of the South of the Central Russian upland there is a tendency to increase the area of populations of the introduced but invasive species of *A. syriaca* in a wide range of habitats. The fact of species-introduced *A. syriaca* into zonal types of steppe vegetation with a tendency to increase its share in phytocenoses with possible further displacement of native species by it is established. In the conditions of habitats adjacent to agrophytocenoses, *A. syriaca* forms stable full-fledged populations with high seed productivity and high aboveground phytomass, which are most productive in the ecotone conditions of bayrach forests, forest belts and fallow lands. The species has a high ability to introduce agrophytocenoses to cultivated land, this makes it an extremely dangerous component of segetal communities in the Central Chernozem region, capable of causing significant economic damage. It is necessary to monitor population *A. syriaca* in all regions and develop measures to prevent its widespread distribution in agrophytocenoses.

Keywords: invasive species, reproductive enhancement, seed productivity, morphometric mass indicators, *Asclepias syriaca* L



1. Introduction

Due to the expansion of the list of forage crops - an introduced species - potential sources of biofuels, researches' attention is increasingly drawn to the species *Asclepias syriaca* L. [Roşu et al., 2011]. Plants of this species are characterized by a high rate of growth of biomass, unpretentiousness.

Beekeepers value *A. syriaca* as a honey-bearing and important nectar-bearing crop [Farkas, Zajác, 2007].

The texture of *A. syriaca* contain asclepiadean glycoside with the action of strophanthin, the content of rubber reaches 10-12 %, and the seeds contain from 15 to 20 % semi-drying oils [Sudnik-Wójcikowska, 2011].

The species belongs to a fairly large North American *Asclepias* genus, which according to various sources has from 100 to 200 species [Woodson, 1954; Stoepler et al., 2012]. Representatives of this genus quite actively settle around the world. For example, 4 species have already been identified in Poland: *A. incarnate* L., *A. speciosa* Torr., *A. syriaca* L. и *A. tuberosa* L. [Pogorzelec, 2006]. In Eastern Europe, the species presumably appeared in the XVII – XVIII century [Bacieczko, Borcz, 2015]. *A. syriaca* was introduced to the Botanical gardens of Russia in the middle of the XIX century. And in 1914, the departure of the species from the crop was established [Dvirna, 2018].

Initially, in many countries, including the former Soviet republics, the species *A. syriaca* was considered as a promising technical (for producing fiber, rubber), honey-bearing and decorative culture [Bagi, 2008; Dvirna, 2018].

The ability of the species to leave the culture, easily adapt to new ones conditions and naturalize, at the first stage of its introduction is not taken into account.

Currently, it is proved that *A. syriaca* is an ergasiophyte that is actively distributed from the culture and is capable of naturalization in various soil-climatic conditions, especially in anthropogenic - transformed landscapes [Protopopova, Shevera, 2014; Dvirna, 2018].

Active dispersal and formation of *A. syriaca* colonies in the ecotopes located near the centers of its primary introduction to the culture: on edges, on roadsides, in woodlands, on meadows, deposits, etc. wastelands where no agricultural activities are conducted, etc. [Rutkowski et al., 2015; Kelemen et al., 2016].

It is shown that in the presence of *A. syriaca*, the biological diversity of not only flora, but also fauna, in particular, species invertebrates [Gall et al., 2015; Somogyi et al., 2017; Bakacsy, 2019].

In 2017, *A. syriaca* was included in the list of EU countries invasive alien species that are being monitored [http://data.europa.eu/el/reg_impl/2017/1263/oj].

As a dangerous invasive species, its biology and settlement in more than 23 countries: in the Czech Republic [Vegetace České republiky..., 2009], Belgium [Verloove, 2006], Austria [Follak et al., 2018], Poland, Germany, [Paukova et al., 2014; Protopopova, Shevera, 2014; Rutkowski et al., 2015; Bacieczko, Borcz, 2015], Hungary, etc. [Tokarska-Guzik, Pisarczyk, 2015; Bakacsy, 2019].

In this regard, they study the features of pollination, reproduction, chemical composition and genetic structure of populations *A. syriaca*, ability to hybridize, etc. [Wyatt, Broyles, 1994; Sikorska, Matławska, 2000; Sikorska et al., 2001; Kabat et al., 2010; Stepler et al., 2012; Rico no et al., 2020].

Study the floristic composition of the communities in which a grows *A. syriaca* [Cherniavskih et al., 2010; Pauková et al., 2013, 2014].

It is believed that the settlement of *A. syriaca* L., as well as a number of other alien species come along the roads as invasion corridors. Because of maintenance open spaces are created on roadsides and slopes along roads that are favorable for implementation. [Christen, Matlack, 2006; Tokarska-Guzik et al., 2012; Follak et al., 2018].

In some studies, *A. syriaca* L. is considered an invasive species, which does not pose a great danger to agricultural production. It is noted that it occurs sporadically in fields, vineyards, fruit orchards in Hungary and France. It is considered a weed species at home [Hartzler, Buhler, 2000; Follak et al., 2018].

Along with this, there are more and more studies about the dangers of implementation *A. syriaca* L. in the fields of agricultural crops [Hartzler, Buhler, 2000; Zalai et al., 2017; Schuster et al., 2018].

To combat the spread of *A. syriaca* recommend frequent mowing of roadsides in order to deplete plants and sowing fast-growing competitive crops [Schuster et al., 2018]; herbicide treatment [Zalai et al., 2017].

Thus, in the conditions of agricultural landscapes of Central Russia in various habitats, the dynamics and state of coenopopulations of the introduced *A. syriaca* species, which currently has a high potential invasive hazard, were studied.

2. Methods and materials

Research held in the Belgorod region near the village of Kulma, Novy Oskol urban district.

In the process of testing crops and clarifying the boundaries of fields of agricultural enterprises, numerous populations were identified *A. syriaca*.

To assess the dynamics of the distribution *A. syriaca* in 2012 a polygon has been formed for stationary observations on an area of about 5000 ha under the name of the Stationary 1 "Kulma". Model coenopopulations (Coenotic population – CP), growing in various habitats were identified within this stationary. The article presents the results of research of habitats adjacent to arable land, which can serve as potential reserves of *A. syriaca* and a source of its infestations on arable land:

1. CP 1. Was detected on an extensively used arable land plot in 2012 city Plot was used for sowing grain crops and sunflowers. It was periodically left untreated for one to two years. Coordinates: 50°45'16.8"N 37°45'05.6"E. The soil is dark gray forest. Content of easily hydrolyzed nitrogen 154 mg*kg⁻¹, P₂O₅ 183 mg*kg⁻¹, K₂O 196 mg*kg⁻¹, pH_{sol} 5.6, content of humus 4.9 % (Fig. 1 a).
2. CP 2. Was detected on the site of a long-term reservoir in 2012. Coordinates: 50°45'10.9"N 37°45'01.4"E. The soil is dark gray forest. Content of easily hydrolyzed nitrogen 189 mg*kg⁻¹, P₂O₅ 77 mg*kg⁻¹, K₂O 140 mg*kg⁻¹, pH_{sol} 5.3, content of humus 6.1% (Fig. 1 b).
3. CP 3. Was detected in the steppe community of the ravine-girder complex in 2018. Coordinates: 50°46'09.3"N 37°43'24.6"E. The soil is leached chernozem slightly eroded. Content of easily hydrolyzed nitrogen 183 mg*kg⁻¹, P₂O₅ 94 mg*kg⁻¹, K₂O 181 mg*kg⁻¹, pH_{sol} 6.7, content of humus 6.3% (Fig. 1 c)
4. CP 4. Was detected in the lower part of the ravine in a gully-beam complex with chalk outcrops in 2012. Coordinates: 50°46'09.3"N 37°43'25.2"E. The soil is washed away reclaimed. Content of easily hydrolyzed nitrogen 168 mg*kg⁻¹, P₂O₅ 204 mg*kg⁻¹, K₂O 182 mg*kg⁻¹, pH_{sol} 6.6, content of humus 4.6 % (Fig. 1 d).
5. CP 5. Was detected on the glade of the broad-leaved forests growing on the bottom and slopes of gullies in 2012. Coordinates: 50°45'34.6"N 37°45'02.5"E. The soil is dark gray forest. Content of easily hydrolyzed nitrogen 181 mg*kg⁻¹, P₂O₅ 216 mg*kg⁻¹, K₂O 244 mg*kg⁻¹, pH_{sol} 5.6, content of humus 5.8% (Fig. 1 e).
6. CP 6. Was detected at the edge of the forest belt in 2012. Coordinates: 50°45'20.8"N 37°45'32.5"E. The soil is dark gray forest. Content of easily hydrolyzed nitrogen 183 mg*kg⁻¹, P₂O₅ 194 mg*kg⁻¹, K₂O 233 mg*kg⁻¹, pH_{sol} 5.7, content of humus 6.1% (Fig. 1 f).

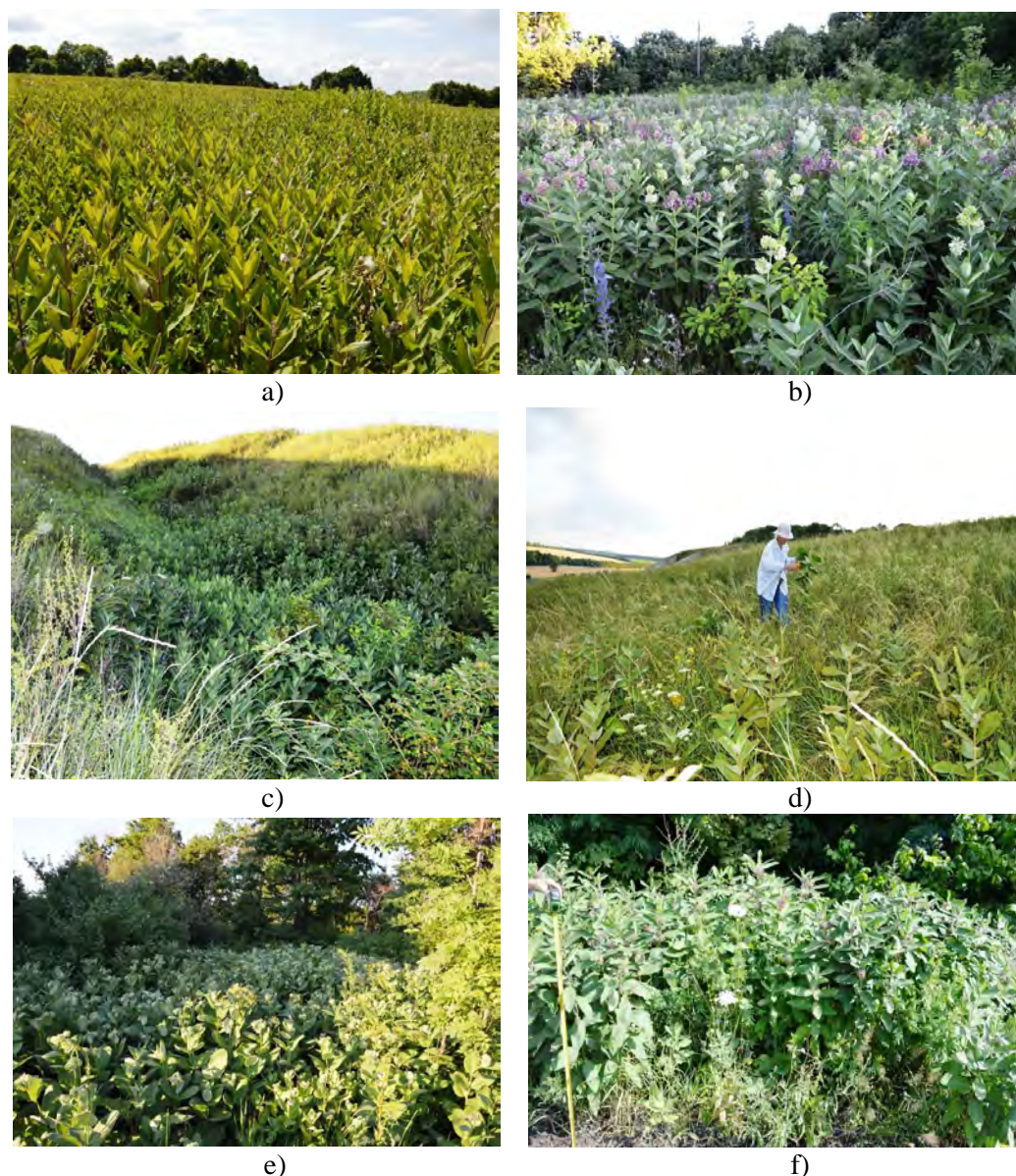


Figure 1. Cenopopulations *A. syriaca* in various habitats (Stationary “Kulma”, Novy Oskol urban district, Belgorod region) a) CP 1, b) CP 2, c) CP 3, d) CP 4, e) CP 5, f) CP 6

The main observations and records were made during the bearing phase.

The agrochemical research were performed using standard methods: easily hydrolyzed nitrogen by the Kornfeld method, mobile compounds of phosphorus and potassium by the Chirikov method (GOST 26204-91), pH (GOST 26423-85), the humus content determined - by the Tyurin method.

The profusion *A. syriaca* in communities in various habitats, the brown-Blanque method was used to determine [Braun-Blanquet, 1928].

To assess the main morphometric parameters (stem mass, stem height, number of copulations per 1 stalk), 120 stems were selected from each model population.

To assess the number of stems and productivity of the species per unit area in coenopopulation in 12-fold repetition, test sites with an area of 1m² were laid.

To determine the number of seeds in a single stem and the weight of 1000 seeds were taken for 30 stems.

Reproductive effort showing the proportion on the plant's reproductive part in the total phytomass was calculated as the ratio of the mass of absolutely dry matter of seeds from an area of 1m^2 to the mass of absolutely dry matter of aboveground phytomass from an area of 1m^2 .

The area of populations in various habitats was determined by determining reference points using a portable GPS-Navigator, constructing a polygonal, dividing the area into several triangles, and calculating the area using the "triangles" method.

The research was performed using a single method in 2012, 2018 and 2019.

Based on the obtained information, mathematical processing was performed with the calculation of averages, error of averages and coefficients of variation of features [Dospekhov, 2012].

3. Results and discussion

A.syriaca L. - dicotyledonous herbaceous plant capable of rapid growth. The entire plant is covered with short whitish threads. Leaves are simple, have a short petiole, length from 10 to 20 cm, width - 5-10 cm, oblong-elliptical shape, densely covered with whitish threads from below, rarely from above. Large flowers of various colors - from white and pink to red - collected in an inflorescence umbrella. Corolla almost incised to the base, oval blades 6-7 mm long. Fetus - leaflet - elliptical in shape, 4.0 -12.0 cm long and 1.0-3.0 cm wide. Seeds are ovoid, 0.8-1.1 cm long, brown, with white silky threads.

In the region it blooms in June-July, bears fruit in August-September. The plant is insect-pollinated. It can grow in one place for more than 50 years. It has a plagiotropic branched rhizome that penetrates the soil to a depth of 2 to 4 meters. During the growing season, horizontal tiers grow from the main part of the rhizome, giving new aboveground shoots.

Research has revealed that *A.syriaca* is a species that can potentially develop intensively in the conditions of major agricultural crops, causing significant economic damage. In the course of route research, fields with clogging of crops with this species were identified. It can form monodominant communities in a number of crops, forming monodominant thickets over large areas and demonstrating resistance to herbicides (Fig.2)



Figure 2. *A. syriaca* in soy crops (Stationary "Kulma", Novy Oskol urban district, Belgorod region).

Habitats located in close proximity to arable land are of great importance for the conservation and development of invasive populations.

Research has established a tendency to increase as the area of ceonopopulations *A. syriaca*, and abundance scale Braun - Blanquet in plant communities in all habitats (table №1).

Table 1. The dynamics of the area of the populations and abundance *A. syriaca* in different habitats (Stationary “Kulma”, Novy Oskol urban district, Belgorod region).

Coenotic population	Dimensions, m ²			Abundance to Braun - Blanquet		
	2012	2018	2019	2012	2018	2019
CP 1	140000	140000	140000	2	4	4
CP 2	56	1038	1038	2	4	4
CP 3	0	306	423	0	1	2
CP 4	12	74	74	5	5	5
CP 5	14	537	540	5	5	5
CP 6	76	344	344	4	4	4

The area is not increased only on arable land due to the limited area of the field and its periodic processing, but the abundance has increased significantly.

An important trend identified in the research process is the introduction of *A. syriaca* in natural zonal phytocenoses. At the CP 3 site located in a steppe area with a spread of *Stipa pennata*, *Stipa capillata*, *Caragana frutex* and other typical steppe species in the course of the 2018-2019 research, a full-term coenopopulation *A. syriaca* was identified for the first time, with both seed and vegetative propagation. There was an increase in its area in 2019 compared to 2018.

Coenopopulations of forest-edge ecotones of both broad-leaved forest and forest belts were stable and they have increased their area by 4.5 - 38 times since 2012. Dynamics of morphometric indicators of the biomass of the coenopopulations *A. syriaca* in different habitats is revealed in table №2.

Indicators of the stem mass and plant height remained stable in all habitats during all study periods.

Table 2. Dynamics of morphometric indicators of the biomass of the coenopopulations *A. syriaca* in different habitats (Stationary “Kulma”, Novy Oskol urban district, Belgorod region).

Indicators	Coenotic population	2012		2018		2019	
		M±m	Cv	M±m	Cv	M±m	Cv
Weight of stem, g (n=120)	CP 1	64.1±1.5	26.4	62.2±1.4	25.1	63.2±0.9	16.3
	CP 2	58.3±1.0	19.4	56.8±1.1	21.4	60.1±1.0	19.0
	CP 3	31.1±1.7	60.1	39.7±1.9	53.3	41.1±1.7	44.3
	CP 4	71.2±1.6	24.4	78.6±1.0	14.3	82.1±0.8	10.1
	CP 5	159.4±1.5	10.5	157.5±1.7	11.5	160.1±1.2	8.0
	CP 6	128.6±1.9	16.6	128.6±1.7	14.1	129.4±1.5	12.5
t st 0.05=1.98; t st 0.01=2.62							
Height of stem, cm (n=120)	CP 1	122.9±2.1	18.4	116.5±2.3	21.8	118.9±1.7	10.6
	CP 2	142.2±2.1	16.2	135.9±2.3	18.8	136.8±1.4	11.1
	CP 3	97.1±1.7	18.8	104.5±1.9	20.3	118.1±1.9	12.0
	CP 4	130.6±1.1	9.3	136.8±1.1	8.6	142.3±0.8	6.3
	CP 5	189.2±1.0	6.0	180.1±0.6	3.9	182.1±0.5	2.9
	CP 6	179.3±1.2	7.1	187.2±0.5	3.2	181.4±0.4	2.3

t st 0.05=1.98; t st 0.01=2.62							
Number of stems, PCs. $*(m^2)^{-1}$ (n=12)	CP 1	38.2±0.9	7.9	36.3±0.9	8.8	35.9±0.9	8.9
	CP 2	24.3±7.2	103.3	23.3±0.4	6.5	39.8±0.4	3.8
	CP 3	7.0±0.3	12.9	12.7±0.3	9.1	15.6±0.3	7.4
	CP 4	24.3±0.4	6.3	23.3±0.4	6.5	25.3±0.4	6.0
	CP 5	37.1±1.1	10.7	45.0±1.0	8.0	44.9±1.0	8.0
	CP 6	38.8±1.5	13.4	41.2±1.3	11.2	42.6±1.3	10.8
t st 0.05=2.18; t st 0.01=3.05							

*M - average, m - average error, Cv - coefficient of variation, t st - Student's coefficient

The general tendency is to increase the number of stems per unit area - in 2018-2019 compared to 2012 in all habitats, except for the coenopopulation CP 1 (extensive arable land). The indicator was stable in this area.

Generally, there is a tendency to increase phytomass *A. syriaca* over an 8-year period of research in all habitats, with the exception of arable land.

Coenopopulations *A. syriaca* form a phytomass from 0.218 to 7.188 kg/m² depending on the habitats and year of research.

A more pronounced increase in phytomass was observed in the long-term deposit (CP 2) and in the steppe community (CP 3) - by 40% and 60% respectively.

The most stable aboveground productivity *A. syriaca* was on arable land (CP 1) and was 2.449 kg/m² in 2012, 2.260 and 2.269 kg/m², respectively in 2018 and 2019.

On the clearing in the broad-leaved forest growing on the bottom and slopes of gullies (CP 5) population *A. syriaca* had the maximum productivity of aboveground phytomass - 5.914 kg/m² in 2012, 7.086 kg/m² in 2018 and 7.188 kg/m² in 2019 with an intra-population coefficient of variation Cv=12-17%.

Minimum productivity of aboveground phytomass *A. syriaca* was noted in the steppe community (CP 3), - 0.218 kg/m² in 2012, 0.53 kg/m² in 2018 and 6.41 kg/m² in 2019 with an intra-population coefficient of variation Cv=4.8-10.6%.

The most important indicators of viability and invasiveness of a species are indicators of its reproductive capacity, primarily seed reproduction. Generative reproduction is the main mechanism for maintaining population heterogeneity and stability in different communities.

Many authors note the danger of vegetative reproduction *A. syriaca* and a rather low activity of seed propagation. It is noticed that the thickets are mostly clones. [Rutkowski et al., 2015; Dvirna, 2018].

However, recent research has revealed that seed propagation can play a decisive role in the spread of this species and the formation of stable, heterogeneous populations. Data obtained by genotyping populations located at a distance of 0.5 m from each other revealed that their genetic similarity is less than 7%, which indicates active sexual reproduction [Ricono et al., 2020].

In this regard, it is important to assess the potential of seed propagation and population development generally in places of "shelters" that are not accessible for effective impact on populations and can form an active seed and vegetative pool for reproduction and the potential of invasions on cultivated areas of agroecosystem.

Research revealed that depending on the habitats in population *A. syriaca* formed by a different number of infructescence growing on a single stem, number of seeds in single infructescence and seeds are formed of different execution (table №3)

Table 3. Dynamics of reproductive indicators of *A. syriaca* coenopopulations in different habitats (Stationary “Kulma”, Novy Oskol urban district, Belgorod region).

Indicators	Coenotic population	2012		2018		2019	
		M±m	Cv	M±m	Cv	M±m	Cv
Number of infructescence per 1 stem, PCs.(n=120)	CP 1	2.8±0.2	62.9	2.6±0.2	80.7	4.3±0.1	21.4
	CP 2	3.1±0.1	40.3	2.8±0.1	42.5	4.1±0.1	24.4
	CP 3	1.4±0.1	108.6	2.1±0.2	96.0	2.9±0.1	41.4
	CP 4	3.2±0.2	59.1	2.8±0.2	71.7	3.4±0.1	41.2
	CP 5	6.1±0.1	20.3	6.7±0.1	23.7	6.9±0.1	17.4
	CP 6	7.2±0.1	18.1	6.4±0.1	23.4	6.5±0.1	13.8
t st _{0.05} =1.98; t st _{0.01} =2.62							
Number of seeds in 1 copulation, PCs (n=30)	CP 1	210.5±6.6	17.1	206.0±7.1	19.0	213.8±4.9	12.5
	CP 2	212.7±6.5	16.8	211.0±7.1	18.5	218.0±5.4	13.6
	CP 3	215.1±6.6	16.8	211.9±6.8	17.6	216.9±5.7	14.4
	CP 4	210.2±7.5	19.5	210.5±6.6	17.1	215.6±4.9	12.5
	CP 5	207.8±7.8	20.5	206.3±8.1	21.5	216.4±6.4	16.1
	CP 6	216.4±4.7	11.9	216.1±5.7	14.5	218.9±4.9	12.2
t st _{0.05} =2.04; t st _{0.01} =2.75							
Weight of 1000 seeds, g (n=120)	CP 1	5.3±0.1	7.5	5.3±0.2	13.4	6.3±0.1	7.9
	CP 2	6.1±0.2	9.8	5.4±0.2	13.5	6.1±0.2	13.1
	CP 3	5.2±0.2	11.5	5.5±0.3	18.8	5.9±0.2	15.3
	CP 4	5.8±0.1	6.9	6.7±0.1	4.8	6.5±0.1	3.1
	CP 5	5.2±0.2	11.5	5.1±0.2	13.2	6.8±0.2	11.8
	CP 6	6.2±0.2	11.3	6.0±0.1	8.3	6.4±0.1	6.3
t st _{0.05} =2.04; t st _{0.01} =2.75							
Reproductive effort of populations, % (n=12)	CP 1	4.9±0.6	44.7	4.6±1.0	75.7	9.2±1.0	37.9
	CP 2	6.9±0.5	23.6	5.6±0.7	40.1	9.1±0.7	24.9
	CP 3	5.0±1.2	81.4	6.2±1.3	70.9	9.0±1.3	48.4
	CP 4	5.5±0.8	51.1	5.1±1.3	89.2	5.8±1.3	77.8
	CP 5	4.1±0.3	27.1	4.5±0.5	35.7	6.3±0.5	25.1
	CP 6	7.5±0.4	20.2	6.5±0.4	19.1	7.0±0.4	17.5
t st _{0.05} =2.18; t st _{0.01} =3.05							
Number of seeds,thousand PCs.*(m ²) ⁻¹	CP 1	22.5±0.7	11.2	19.5±0.8	14.5	33.0±0.8	7.9
	CP 2	16.0±0.4	8.9	13.8±0.4	11.2	35.6±1.0	9.7

(n=12)	CP 3	2.1±0.1	11.7	5.6±0.3	16.7	9.8±0.3	9.2
	CP 4	16.3±0.8	17.3	13.8±0.6	15.7	18.5±0.6	11.6
	CP 5	47.0±1.3	9.8	62.2±2.0	11.2	67.0±1.7	8.7
	CP 6	60.5±1.7	9.8	57.0±1.4	8.4	60.6±1.6	9.1
t st 0.05 =2.18; t st 0.01=3.05							

The most and stable seed productivity was observed in coenopopulations formed on ecotone areas of the forest belt edge (CP 6) and in the broad-leaved forest growing on the bottom and slopes of gullies (CP 5). Here, apparently, there are optimal conditions for moisture supply and nutritional regime for *A. syriaca*.

At the same time, in areas with more severe conditions for a complex of ecotopics factors - the steppe section (CP 3), long-term deposit (CP 2) and extensively used arable land (CP 1) significantly higher reproductive effort was revealed.

Generally, there is a tendency to increase seed productivity *A. syriaca* in all habitats with increasing soil phosphorus and potassium, which is confirmed by the positive correlation between content of soil phosphorus and seed productivity $r=0.621\pm0.112$ and potassium - $r=0.649\pm0.091$.

No correlation was found between pH and seed productivity *A. syriaca*.

A strong positive correlation was found between the humus content and seed productivity *A. syriaca*.

At the same time, there is a tendency to increase the reproductive effort of populations *A. syriaca*, as the content of phosphorus in the soil decreases, which is confirmed by a negative correlation of the average strength between the content moving phosphorus in the soil and reproductive effort $r = -0.589\pm0.118$.

4. Conclusion

1. In the conditions of agrophytocenosis and adjacent lands of Central Russia, a tendency to increase the area of populations of the introduced but invasive *A. syriaca* species in a wide range of habitats was revealed.
2. The fact of introduction of the introduced species *A. syriaca* into zonal types of steppe vegetation with a tendency to increase its share in phytocenoses with possible further displacement of native species by it is established.
3. In the conditions of habitats adjacent to phytocenoses, *A. syriaca* forms stable full-fledged populations with high seed productivity and high aboveground phytomass that are most productive in the ecotone conditions of road-leaved forests growing on the bottom and slopes of gullies, forests belts and fallow lands.
4. The species has a high ability to introduce agrophytocenoses to cultivated lands, which makes it an extremely dangerous component of segetal communities in the Central - Blackearth region, which can cause significant economic damage.
5. It is necessary to monitor populations of *A. syriaca* in all regions and develop measures to prevent its widespread distribution in agrophytocenoses.

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